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COMPARISON OF ULTRASOUND WITH ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY AND SURGERY IN THE DETECTION OF SITE AND CAUSE BILE DUCTS DILATATION

Masoud. Pourissa MD1

Neurosciences research center, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran.

Sepideh. Mesbahi MD2

Department of Radiology, Faculty of Medicine, Alleppo University, Alleppo, Syria.

Soheila. Refahi PhD3
(Corresponding Author)
Department of Physics and Medical Engineering. Faculty of Medicine. Tehran University of Medical Sciences, Tehran, Iran.

Department of Medical Physics, Faculty of Medicine, Ardebil University of Medical Sciences,
Ardebil, Iran.

Tel:+989144142689
E-mail: Refahi@razi.tums.ac.ir or S.Refahi@arums.ac.ir

Yaser TabarraeiMSc4

Department of biostatistics, Faculty of Health, Sabzevar University of Medical Sciences, Sabzevar, Iran

ABSTRACT

Background and Objectives: Ultrasound (US) is the initial imaging test used in the evaluation of patients with biliary tract disease. Our retrospective study was designed to evaluate the capacity of ultrasound to determine the cause and site of bile ducts dilatation, and to compare the accuracy of ultrasound with endoscopic retrograde cholangiopancreatography (ERCP), a well-accepted procedure and surgery as practiced on 53 patients.

Patients and Methods: 40 patients with ultrasonographic, endoscopic retrograde cholangiopancreatography and surgery reports were entered into the study. sonographic reports of each patient were compared with endoscopic retrograde cholangiopancreatography and surgery findings.

Results: The most common cause of dilatation was stones followed by bile ducts tumors. Tumors were located in intrapancreatic common bile duct in 81.8%. The sensitivity of ultrasound was 100% in diagnosis of stones and 83.3% in tumors respectively. Comparison of the ultrasound and endoscopic retrograde cholangiopancreatography and surgery findings revealed a correct sonographic diagnosis in 92.5% of cases.

Conclusion: Our study showed that ultrasound had a high accuracy and sensitivity of 92.5% and 94.4%, respectively in the diagnosis of bile ducts dilatation.

Keywords: *ultrasonography; endoscopic retrograde cholangiopancreatography; bile duct; surgery; dilatation*

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Introduction

Ultrasound (US) is the initial imaging test used in the evaluation of patients with biliary tract disease such as bile duct stones (Varghese et al., 1999). Endoscopic retrograde cholangiopancreatography (ERCP) is a well-established method of diagnosing and treating disorders of the bile and pancreatic ducts (Loperfido et al., 1998). In the past ten years, there have been major developments in imaging of the pancreatic and bile ducts which give the same information as diagnostic cholangiography and pancreatography in all but a few cases. In the future, ERCP will be reserved for therapy (Sheridan, 2002). A major benefit of ERCP in the evaluation of choledocholithiasis is that ERCP provides a means of diagnosis and therapeutic intervention in the same setting (Ann and Fulche, 2002). This study was designed to evaluate the sites and causes of bile ducts dilatation. An additional aim of the present approach was to compare the accuracy of ultrasound with endoscopic retrograde cholangiopancreatography (ERCP), a well-accepted procedure and surgery.

Patients and Methods

From September 2005 through July 2007, in a retrospective study we reviewed reports of fifty-three patients who referred for ultrasound diagnosis of bile duct within the Department of ultrasound at teaching Imam Hospital, Tabriz, Iran. The patients were fasted overnight and examined in the supine and right anterior oblique positions to optimally visualize the biliary ducts. Special maneuvers such as compression were routinely performed and probe was placed as axial and sagittal on the lower portion of pancreas to visualize the lower bile duct (Figuers 1, 2).

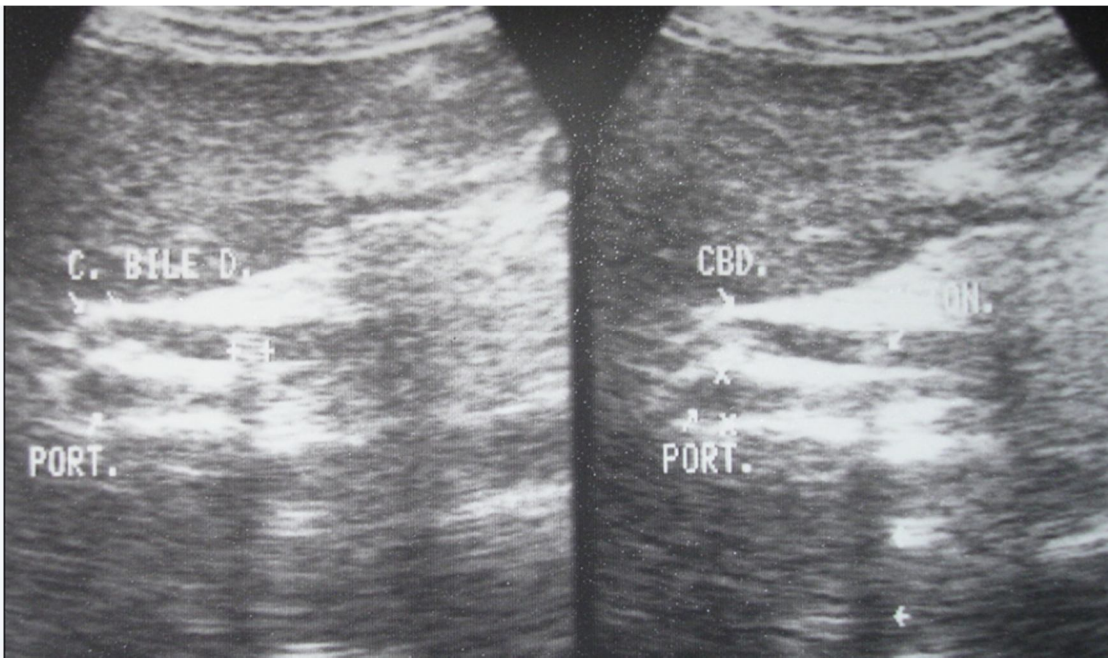

Fig1. A 41 years old female with history of pain at RUQ. and mild jaundice.Echogene lesion is noted in CBD with acoustic shaddow

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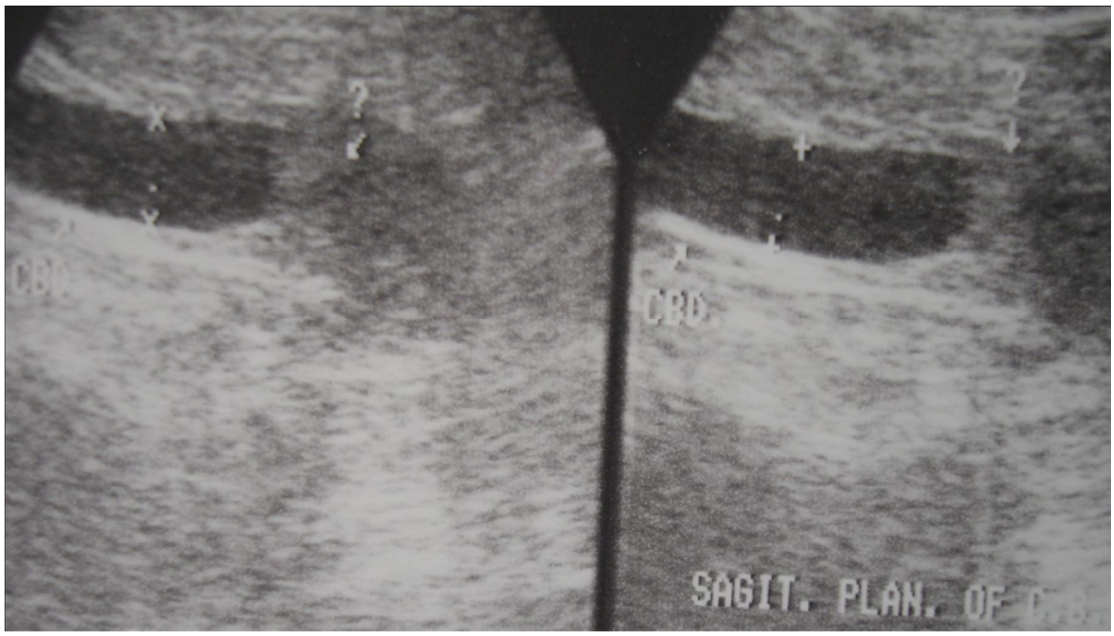

Fig 2. A 67 years old man with history of severe jaundice.Sagittal section is performed along common bile duct which shows a hypoechoi.

All ultrasound examinations were performed by an experienced sonologist using a General Electronic Model X200 ultrasound unit with 3.5 MHz curvilinear probe. Diameter of >7 mm were considered as dilated-caliber ducts. The ERCP examination was performed by two endoscopists and the taking of images supervised by one radiologist. For the purposes of this study the hard copy images of ERCP and ultrasound examinations and surgery findings of each patient were collected and the patient details masked. Patients who had not exact US and ERCP and surgery reports excluded from the study. The final diagnosis was based on ERCP and surgery. The extrahepatic biliary system was divided into three regions: the porta hepatic, the suprapancreatic common bile duct, and the intrapancreatic or ampullary portion of the common bile duct (Figure 3).

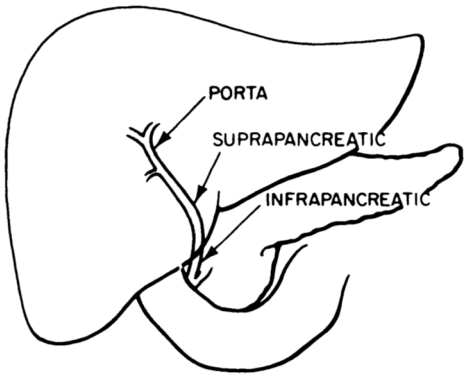

Fig3. Schematic drawing of the three anatomic divisions of the extrahepatic common bile duct.

When possible the site of obstruction was determined from the ultrasound study to be one of these three regions. Data were analyzed in SPSS version 11.5 software for descriptive assessment and comparison of the US and ERCP and surgery diagnoses were performed manually by related formulas. The sites and causes of dilatation of bile ducts, accuracy, sensitivity, specificity, and positive and negative predictive values were determined for US assessment.

Results

Thirteen patients were excluded from this study for the following reason: ERCP hard- copy images and surgery findings were not available. 40 patients (F: M 25/15; mean age, 54.9±9.58 years; range 38-75 years) were entered into the study. Table 1 summarized the ERCP and surgery findings in patients.

Table 1. Causes of dilatation based on ERCP and surgery (n=40)

Cause	No. of patients	%
Stone	20	50
Tumor	12	30
Cyst	2	5
Pancreatitis	1	2.5
Stricture	1	2.5
No organic lesion	4	10
Total	40	100

The most common diagnosis made by ERCP and surgery was bile duct stone (BDS) followed by bile duct tumor. Findings at ERCP and surgery showed bile duct stone in 20 of 40 patients. In all these cases US was able to detect BDS by sensitivity of 100%.

In four of patients was not a specific cause for bile duct dilatation found. According to ERCP and surgery reports, the rate of a bile duct tumor was 12 in 40 patients. Ten of bile duct tumors were correctly identified by ultrasound by sensitivity of 83/3%. The sensitivity of US for detection of cysts, pancreatitis and stricture was 100%. Comparison of results as assessed by ERCP and surgery with US illustrated in Table 2.

Table 2. Comparison of ERCP and surgery findings with US reports

ERCP / Sonography	Positive	Negative	Total
Positive	34	1	35
Negative	2	3	5
Total	36	4	40

Note. Sensitivity (TP/TP+FN) = 94.4%%. Specificity (TN/TN+FP) = 75%. Positive predictive value (TP/TP+FP) = 97%. Negative predictive value (TN/TN+FN) =60%. Accuracy (TP+TN)/ (P+N) =92.5%

There were 34 true-positive and two false-negative reading by sonograms yielding a sensitivity of 94.4%, specificity of 75%, positive predictive (PPV) of 97%, and negative predictive value (NPV) of 60%. A correct US diagnosis was obtained in 37 of 40 patients yielding an accuracy of 92.5%.

Table 3 demonstrates the results of the assessment of the 40 cases with respect to site of obstruction.

Table 3. Site of obstruction

Site	Determination	
	Correct	**Incorrect**
Intrapancreatic common duct	26	1
Port hepatis	3	1
Suprapancreatic common duct	1	1

The common site of obstruction was in the intrapancreatic common duct followed by porta hepatis. Of the 40 cases, we were unable to determine the site of obstruction in 7(17.5%). We determined the site of obstruction in 33 (82.5%) cases and we were correct in 30 (90.9%) of these cases, or 75% of the total patient group. None of the three sites appeared to be more easily determined than the others.

Discussion

The goal of biliary tract imaging is twofold: (1) to detect the presence of biliary duct dilatation and (2) to identify common duct stones (Joseph and Ferrucci, 2001). At present, US is often the first imaging modality used for evaluation of biliary disease (Khan et al., 2002). In the detection of bile duct dilatation, ultrasound reveals up to 100% sensitivity for experienced examiners (Rosch et al., 2002; Bloom et al., 1999). The stone detection rate is also influenced by patient factors such as the number, size and site of stones, patient body habitus and the presence of overlying bowel gas (Prat., et al 1996). The accurate diagnosis of choledocholithiasis is difficult and often relies on direct cholangiographic techniques such as ERCP. In clinical practice the non-invasive diagnosis of choledocholithiasis is based on a combination of clinical suspicion, biochemical analysis and imaging findings (Rieger and Wayand, 1995; Jensen et al., 1985; Barkun et al., 1994; Abboud et al., 1996). Unfortunately, all of these tests have varying diagnostic accuracies and there is no one reliable method of uniformly identifying patients with BDS (Guiband et al., 1995). US is less effective when choledochal stones are located far distally in the head of the pancreas, when there is overlying bowel gas, or when obese patient habitus degrades image quality. Moreover, US remain a highly operator-dependent method, and the results are always influenced by the skill of the examiner (Joseph and Ferrucci, 2001). In our study sensitivity US for detection of BDS was 100%.Varghese et al in their study, showed that US detected BDS in 13 patients and missed stones in 21 patients, 6 of whom had non-dilated bile ducts. They reported sensitivity, specificity and diagnostic accuracy of 38%, 100% and 89%, in the US diagnosis of choledocholithiasis (Varghese et al., 1999). The results of previous studies indicate that sensitivity and specificity of US for detection of BDS is at 25-80%, 80-100%, respectively (Sheridan, 2002). In another study by David indicate sensitivity of US in the detection choledocholithiasis is rather poor, with only 22% of cases interpreted as positive (Einstein et al., 1984). Bile duct cyst (BDC) are rare and of unknown origin and may represent a precursor for biliary tract cancer development (Adkins et al., 2000; Söreide et al., 2004; Tashiro et al., 2003). BDC are often first suspected or diagnosed by the patobiliary imaging studies initiated for evaluation of upper abdominal complications (Søreide and Søreide 2007). A BDC may be visualized by any of the modalities available such as US or by direct (invasive) ductal imaging using ERCP (Levy and Rohrmann, 2003). In our approach, there were two cases with BDC which detect by US with sensitivity of 100%. The most common biliary tumor is cholangiocarcinoma, an adenocarcinoma arising from the ductal epithelium of the biliary system (Zech et al., 2004). In this study the value of US in demonstrating the tumor itself was compared with ERCP and surgery in patients with biliary duct tumor. The sensitivity of US in the diagnosis of bile ducts tumor was 83.3%. In Horing's et al study correct visualization by US of the tumor itself was possible in 68% of proximal tumors and 36% with distal tumors (Horing et al., 1993). In another study by Rigants et al US correctly defined the cause of obstruction in 90% of the patients with tumoral bile duct obstruction (Rigauts et al., 1992). The results of previous studies indicate that US compares well with direct cholangiography in accurately determining the site and causes of biliary obstruction. We visualized 91% of sites of obstruction. Failure to determine the site of obstruction in 17.5% of the patients was primarily due to the inability to visualize the common duct in its entirety. One must see the dilated common duct terminate at a specific point or merge into a normal-sized common duct to accurately determine the site of obstruction. Thus even duct could not always be seen (Honickman et al., 1983). In conclusion, our results show ultrasonography is an effective method in assessment of bile ducts diseases and 90% of patients with bile ducts obstrauction can diagnose using US.

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